

WHAT IS CLAIMED IS:

1. An electro-optical device comprising, above a substrate:
data lines extending in a first direction;
scanning lines extending in a second direction which intersects the data lines;
pixel electrodes and thin film transistors provided so as to correspond to intersection regions of the data lines and the scanning lines; and
storage capacitors electrically connected to the thin film transistors and the pixel electrodes,
dielectric films which constitute the storage capacitors being made of a plurality of layers including different materials and one of the plurality of layers being made of a material having a higher dielectric constant than those of the other layers.
2. The electro-optical device according to Claim 1, further comprising:
shielding layers provided between the data lines and the pixel electrodes.
3. The electro-optical device according to Claim 1, the dielectric films being made of silicon oxide films and silicon nitride films.
4. The electro-optical device according to Claim 1, the storage capacitors being formed above semiconductor layers of the thin film transistors and below the pixel electrodes.
5. The electro-optical device according to Claim 1, a planarization process being performed on surfaces of an interlayer insulating film which is positioned beneath the pixel electrodes.
6. The electro-optical device according to Claim 1, each of the data lines being formed as the same film as one of a pair of electrodes which constitute each of the storage capacitors.
7. The electro-optical device according to Claim 2, further comprising:
relay layers being electrically connected each of the pixel electrodes to one of a pair of electrodes which constitute each of the storage capacitors.
8. The electro-optical device according to Claim 7, the shielding layers being formed as the same films as the relay layers.
9. The electro-optical device according to Claim 2, the shielding layers being made of transparent conducting materials and formed in a mat shape over the entire surface of the substrate.
10. The electro-optical device according to Claim 2, the shielding layers being formed along the data lines and have a wider width than those of the data lines.

11. The electro-optical device according to Claim 1, the thin film transistors including semiconductor layers having channel regions which extend in a longitudinal direction and channel adjacent regions which extend in the longitudinal direction further from the channel regions;

the scanning lines including main body parts extending in a direction intersecting the longitudinal direction and having gate electrodes of the thin film transistors overlapping the channel regions in plan view; and

horizontal protrusions protruding from the main body parts in the longitudinal direction at sides of the channel adjacent regions in plan view.

12. The electro-optical device according to Claim 1, the thin film transistors including semiconductor layers having channel regions which extend in a longitudinal direction;

the electro-optical device further comprising:

upper light-shielding films covering at least the channel regions of the thin film transistors from the upper side; and

at least a part of the upper light-shielding films being formed in a concave shape in the cross section which is perpendicular to the longitudinal direction of the channel regions as viewed from the channel regions.

13. The electro-optical device according to Claim 1, the thin film transistors including semiconductor layers having channel regions which extend in the first direction;

the scanning lines including main line portions having gate electrodes of the thin film transistors which face the channel regions with gate insulating films interposed therebetween and extending in the second direction which intersects the first direction in plan view; and

surrounding portions extending to surround the semiconductor layers from the main line portions at positions which are separated from the channel regions by a predetermined distance in the second direction in plan view.

14. The electro-optical device according to Claim 1, the thin film transistors including semiconductor layers having channel regions which extend in the first direction;

the scanning lines including main line portions having gate electrodes of the thin film transistors which face the channel regions with gate insulating films interposed therebetween and extending in the second direction which intersects the first direction in plan view; and

vertical protrusions protruding downwardly from the main line portions at positions which are separated from the channel region by a predetermined distance in the second direction in plan view.

15. The electro-optical device according to Claim 14, further comprising:
on the substrate, lower light-shielding films which cover at least the channel regions from the lower side; and
the vertical protrusions contacting the lower light-shielding films at front ends thereof.

16. The electro-optical device according to Claim 1, the thin film transistors including semiconductor layers having channel regions which extend in the first direction;
the scanning lines including main line portions having gate electrodes of the thin film transistors which face the channel regions with gate insulating films interposed therebetween and extending in the second direction which intersects the first direction in plan view; and
the main line portions including inside-groove portions which are provided inside grooves which are etched in the substrate and cover at least a part of the channel regions from the sides.

17. The electro-optical device according to Claim 1, the thin film transistors including semiconductor layers having channel regions which extend in the first direction,
the scanning lines including main line portions having gate electrodes of the thin film transistors which face the channel regions with gate insulating films interposed therebetween and extending in the second direction which intersects the first direction in plan view; and
the main line portions including inside-groove portions which extend in the second direction and are provided inside grooves which are etched in the substrate, and outside-groove portions which extend in the second direction and are provided outside the grooves.

18. The electro-optical device according to Claim 1, a plurality of the pixel electrodes are arranged in a plane and include a first pixel electrode group which is inversely driven at a first period and a second pixel electrode group which is inversely driven at a second period which is complementary to the first period,

the data lines and/or shielding layers including main line portions which are extended to upper sides of the scanning lines so as to interest the scanning lines, and overhanging portions which overhang along the scanning lines;

the electro-optical device further comprising:

counter electrode which faces the plurality of the pixel electrodes on a counter substrate which is provided opposite to the substrate; and

convex portions being formed on base surfaces of the pixel electrodes on the substrate corresponding to the overhanging portions, the convex portions being regions of gaps between the pixel electrodes, which are adjacent to each other with the scanning lines interposed therebetween in plan view.

19. The electro-optical device according to Claim 1, a plurality of the pixel electrodes are arranged in a plane and include a first pixel electrode group which is inversely driven at a first period and a second pixel electrode group which is inversely driven at a second period which is complementary to the first period;

the electro-optical device further comprising:

counter electrode which faces the plurality of the pixel electrodes on a counter substrate which is provided opposite to the substrate;

convex portions formed in regions of gaps between the pixel electrodes which are adjacent to each other in plan view; and

the convex portions having gentle step differences which are formed by removing the planarization films which are formed in advance on the convex portions by an etching process and causing the surfaces of the convex portions which are exposed after removing to be receded.

20. An electro-optical device comprising, above a substrate:

data lines extending in a first direction;

scanning lines extending in a second direction which intersects the data lines;

pixel electrodes and thin film transistors provided so as to correspond to intersection regions of the data lines and the scanning lines;

storage capacitors electrically connected to the thin film transistors and the pixel electrodes; and

light-shielding films provided between the data lines and the pixel electrodes, dielectric films which constitute the storage capacitors being made of a plurality of layers including different materials and one of the plurality of the layers being made of a material having a higher dielectric constant than those of the other layers.

21. An electronic apparatus including an electro-optical device, the electro-optical device comprising, above a substrate:

data lines extending in a first direction;

scanning lines extending in a second direction which intersects the data lines; pixel electrodes and thin film transistors provided so as to correspond to intersection regions of the data lines and the scanning lines;

storage capacitors electrically connected to the thin film transistors and the pixel electrodes; and

dielectric films which constitute the storage capacitors being made of a plurality of layers including different materials and one of the plurality of the layers being made of a material having a higher dielectric constant than those of the other layers.